L.A. Darling Pump-Test Working Session Summary

Bronson, MI 9/28/17

Attendees: Chris Bade (ASI), Raymond Avendt IV (Avendt Group), David Powers (Stantec), Charles Graff (MDEQ), Beth Mead-O'Brien (MDEQ), Chris Ore (SulTRAC), Kathleen Meier (EPA, remote), and Amy Gahala (USGS, remote)

Chris Bade distributed a packet of data including tables and maps from the pumping test conducted between April 28 – May 1, 2017. He then provided a summary of the pre-test activities and the pumping test. A step test was conducted April 4, 2017 to determine acceptable pumping rates. The pump selected for the test could produce a maximum flow rate of approximately 500 gallons per minute (gpm), and the mobile groundwater treatment system could support a maximum flow rate of 420 gpm (with 7.5 minutes of contact time to carbon filters). However, discussions with the City indicated that the wastewater treatment plant (WWTP) system could only accommodate a maximum discharge from the site of 225 gpm. The step test showed that a flow rate of 225 gpm was achievable. Accordingly, the flow rate of the pumping test was set at 225 gpm.

The pumping test was initiated April 25th at 8 am with a flow rate of 225 gpm from TW-1 and was scheduled to run for 72 hours. The first 19 hours produced satisfactory results, however an equipment failure caused the frac tank to overflow at ~3am and pump test #1 was halted. Cleanup and testing activities were performed to address the spill. ASI and MDEQ indicated that the spill response and associated testing have been adequately addressed as of this time. Pumping test #2 was started April 28th with a flow rate of 225 gpm from TW-1and successfully ran for 72 hours.

Depth to Water / Groundwater Elevation measurements were collected both by automatic Leveltroll 700 pressure transducers (shown on table 1) and manual measurements (shown on table 2). The pressure transducers collect a high number of readings in the initial period and then take less frequent readings over time. Measurements taken automatically and manually were comparable. The transducer in OW-1 malfunctioned during test #2 and did not collect any data; therefore, the data from test #1 was used. Table #1 of the handout includes a typo, and the maximum drawdown for OW-1 should be 0.63 feet. Chris Bade indicated that the rest of the data shown for OW-1 was correct. Some drawdown was observed in all monitored wells, including MW-7 which is ~300 ft away from TW-1. The aquifer is very flat and prolific. ASI believes this is good from a pump and treat standpoint.

In general, the depth to the water table is ~8 feet bgs and there is a clay confining layer at ~55 ft bgs (saturated thickness of ~47 ft). There is a layer of coarse gravel above the confining layer. TW-1 is screened over ~80% of the well (partially penetrating), and the

pump was set in the bottom 1/3 of the well. The pump was set relatively deep to be cautious and ensure good production. The location of TW-1 was selected due to the high concentration of COCs present.

Analytical results indicated a wide variability in the data as shown in the handouts. Statistical analysis was used to identify and remove outlying data. Remaining data was averaged to obtain conductivity, transmissivity, specific yield, Kv/Kh ratio, and Sy/S ratio.

Avendt Group would like to re-inject treated groundwater upgradient of the plume to attempt additional flushing of contaminants (and perhaps also to limit the volume of water discharged to the City WWTP). The downgradient stagnation point must be within the property boundary to avoid influence from the industrial sewer located along the eastern curb of N Matteson St. If the extraction wells are set at too high of volume, potential contamination in the sewer area will be drawn onto the L.A. Darling site. However, if there are insufficient extraction wells or too low of a flow rate, groundwater which is re-injected will not be captured by the extraction wells. After evaluating various options, ASI has determined that 7 extraction wells with a combined extraction rate of 80 gpm will be used in conjunction with 5 injection wells with a combined injection rate of 50 gpm. Specific wells and flow rates are detailed in bullet #5 of the handout. If no injection were to be performed performed, ASI estimated that only 6 wells with an extraction rate of 65 gpm would be sufficient to capture groundwater beneath the site.

Proposed extraction and injection well locations are shown on Figures 2 and 3. The green contours in Figure 2 show the path of groundwater that will not be captured by the system. Figure 3 shows that based on the model, groundwater mounding from the injection will be captured by the extraction wells. If a higher injection in set (e.g. 60gpm) the mounding was not captured.

Stantec Engineering will utilize the pumping test data to prepare the final system design. The 30 gpm of extracted groundwater that is not reinjected is anticipated to be discharged to either the sanitary sewer, separate storm sewer, or County Drain #30. Stantec will evaluate the water chemistry and VOC, cyanide, chromium, etc. analytical results from the mobile treatment used during the pumping test to design the treatment system to address COCs. TW-1 was set in an area of high groundwater impact, and with 7 total extraction wells the concentrations of COCs in influent groundwater may be lower. The final configuration of extraction and injection wells and associated monitoring wells will be provided in the final design report.

The COC analytical data collected from the mobile treatment system influent, in-between 2 carbon filters, and effluent was provided in the July monthly report. The analytical data shows some treatment of cyanide and chromium, however detectable levels were present in the effluent. VOCs were not detected in the effluent. Cyanide and chromium discharged in effluent were below the appropriate City limits for the testing period.

Amy asked why the box whisker statistical graph was used rather than a geometric mean. Chris Bade replied that the box whisker was more comprehensive due to the broad range of data observed.

Amy asked if the contaminant plume was believed to be well-defined by the existing monitoring well network. Chris Bade replied that OU2 focuses specifically on the L.A. Darling property and the intent of the current ROD is to prevent contaminated groundwater from migrating off-site. Although Chris had no knowledge of groundwater condition in other operable units, he believes the plume in OU2 is well-defined. Groundwater flow is generally from east to west, and upgradient wells MW-6 and MW-7 have always been non-detect.

Another question was asked regarding how the extraction and injection well locations were selected. Chris Bade stated that the locations were selected based on being within the property boundaries for access considerations while avoiding potential for contamination to be pushed upstream via the injection wells and avoiding capturing off-site water near the sewer and bringing it on-site with the extraction wells. The downgradient stagnation point on Figure 2 is shown near the sidewalk and is close to the property boundary without getting too close to the sewer. The injection wells are situated where previous excavation activity was conducted, and will be located within clean fill material. A leach field was considered in lieu of injection wells, however in general the upper 8-9 ft of soil is silty/clayey soil and a leach field would not be suitable.

Charles asked if there were any plans for a pilot test to be conducted prior to the final system design. David responded that he was not aware of any plans at this time to conduct a pilot test.

Beth asked if there were plans to over-design the system to account for future well fouling. David indicated that Stantec has discussed and will likely plan for additional capacity. Beth added that it may be desirable in the future to shut down some wells and increase the pumping rate from some wells. Chris Bade responded that that would be limited by the sewer west of the property boundary, and at 225 gpm there was capture observed from the sewer area. However, as the aquifer is very prolific, there could be some flexibility to increase the rate of extraction.

Beth asked whether the silt soils would cause an issue outside of historically excavated areas. Chris Bade stated that the soils are coarser as depth increases, and also that excavation was performed only until groundwater was encountered. Wells are anticipated to have a 30 ft screen starting at the top of the water table.

Timeframe to prepare the design was discussed. Chris Bade anticipates completion of the pump test report in a couple of weeks. He planned to submit this to Stantec only as they will include as an attachment to the design, however MDEQ and EPA expressed interest in obtaining when complete also. Stantec estimated eight weeks to prepare the design after receipt of the pump test report. Charles indicated that a NPDES permit may be needed for injection, and this could take 6 months. Chris replied that he did not

believe a NPDES permit would be needed if all the injection points were within the plume of impact. All injection wells are believed to be in the plume except for potentially IW-2, which Chris will evaluate further. Charles and Beth indicated that they would evaluate NPDES requirements further.

Chris Bader asked Amy if she had any insight regarding why the conductivity at TW-1 was found to be much lower relative to the other wells (22.8 vs 300-4410 ft/day). Manual readings could not be collected from this well due to the wires in the way, and therefore the only data available was the transducer data from pump test #1 (19 hours). Amy replied that the deeper screening interval/measurement location may have had an effect, as vertical flow effects would have been negated and flow would be horizontal, which may be more representative. Charles stated that TW-1 was an 8” diameter well, as the pump motor would not have fit in a 6” well and had sufficient water cooling. The observation wells were 2” diameter. This could have had an effect also. Amy will think on this further and respond later. The extraction and injection well model is based on 6” wells. Chris will include 8” wells in the simulation, but does not think it will have much effect on the model.

Chris Ore stated that the pump test plan submitted prior to the field work indicated that the anticipated conductivity was ~145 ft/day based on previous data. As the observed conductivity was ~766 ft/day during this test, he asked for clarification of the different testing procedures that would explain the variability. Chris Bade replied that the tests conducted were on a much different scale – during the remedial investigation, 23 slug tests were performed and the test was a small duration and volume. It is likely that only the water in the filter pack was removed during previous tests. Charles added that no previous pumping test has been performed, and he did not believe Arcadis had done an adequate job previously.